

# **DUNCAN T. MOORE**

## **Curriculum Vitae**

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### **Professional Experience**

Rudolf and Hilda Kingslake Professor of Optical Engineering, 1993- present  
Professor of Biomedical Engineering, 2001-present  
Chief Executive Officer, Infotonics Technology Center Inc., 2002-present  
Special Assistant to the President of University of Rochester and Executive Director of the University, Industry, and Government Partnership for Advanced Photonics, 2001-2002  
Senior Science Advisor, Optical Society of America, Washington, DC, 1/01-present  
Special Advisor to the Director, Office of Science and Technology Policy, Executive Office of the President, The White House, 1/01-5/01  
Associate Director for Technology, Office of Science and Technology Policy, the White House, 12/97-12/00  
Dean, School of Engineering and Applied Sciences, University of Rochester, Rochester, NY, 1995-1997  
American Physical Society Congressional Science Fellow:  
Science, Technology and Space Fellow in the office of Senator John D. Rockefeller IV, West Virginia, 1993-1994  
Professor, The Institute of Optics, University of Rochester, Rochester, NY, 1986-present  
Associate Professor, The Institute of Optics, University of Rochester, Rochester, NY, 1978-1986  
Assistant Professor, The Institute of Optics, University of Rochester, Rochester, NY, 1974-1978  
Director, The Institute of Optics, University of Rochester, Rochester, NY, 1987-1993  
Director, New York State Center for Advanced Optical Technology, University of Rochester, Rochester, NY, 1987-1994  
Editor, Applied Optics, Optical Technology Division; published monthly by the Optical Society of America, 1990-1992  
Visiting Scientist, Nippon Schlumberger K. K., Tokyo, Japan, 1983. Responsible for establishing Optics Department specializing in optical sensors for oil well logging and in optical data storage.  
President - Founder, Gradient Lens Corporation, Rochester, NY, 1980-1997. Performing consulting and design services in gradient-index lenses, conventional lens design, and optical systems analysis.  
Research Staff, Western Electric Engineering Research Center, Princeton, NJ, 1969-1971. Responsible for design and fabrication of specialized lens systems.

### **Education**

Ph. D., Optics, University of Rochester, Rochester, NY, 1971-1974  
Thesis: "Gradient-Index Optics: Aspects of Design, Testing and Tolerancing"  
Advisor: Dr. Philip W. Baumeister

M. S., Optics, University of Rochester, Rochester, NY, 1969-1970  
Thesis: "Aberration Correction using Index Gradients"  
Advisor: Dr. Peter J. Sands

B. A., Physics, University of Maine, Orono, ME, 1965-1969

### **Honors**

1992 Science and Technology Award, Greater Rochester Metro Chamber of Commerce, 27th Annual Civic Awards Ceremony

1993 21st Annual Distinguished Inventor of the Year Award, Rochester Intellectual Property Law Association.

1993 Japanese Applied Physics Society MOC/GRIN '93 Gradient-Index Award

1995 Honorary Doctor of Science, University of Maine

1996 Honorary Membership, Golden Key National Honor Society

1998 Election to the National Academy of Engineering

1999 Engineer of the Year, Rochester Engineering Society

1999 National Engineering Award, American Association of Engineering Societies

2001 Optical Society of America Leadership Award (to strengthen the link between the optics community and the public)

2002 Edward Orton, Jr. Memorial Lecturer, The American Ceramic Society

2002 ASM/TMS Distinguished Lecturer, ASM International

American Men and Women of Science

Who's Who in the 21<sup>st</sup> Century

Who's Who In Technology

Who's Who in the East

Who's Who in America

Who's Who in American Education

Who's Who in the World

Who's Who in Science & Technology

## **Publications**

- "Design of Singlets with Continuously Varying Indices of Refraction", J. Opt. Soc. Am., 61, (7)886-94 (1971).
- "Third-Order Aberrations of Inhomogeneous Lenses with Cylindrical Index Distributions" (with P.J.Sands), J.Opt.Soc.Am., 61, (9), 1195-1201(1971).
- "Lens Designs for Inhomogeneous Glass," Western Electric Technical Notes, 5, (1)(1971).
- "Raytracing in Gradient-Index Media", J. Opt. Soc. Am., 65, (4) 451-55 (1975)
- "Raytracing in Tilted, Decentered, Displaced Gradient-Index Optical Systems", J. Opt. Soc. Am., 66, (8)789-95(1976).
- "Design of High Speed Optical Production Line," (with J.J.Bohache and G.H.Chen) Opt. Eng., 15, (5)416-23(1976).
- "Laser Fusion Microballoon Wall-Thickness Measurements: A Comparative Study" (with G.M.Halpern et al.), J.Appl.Phys., 48, (3)1223 -28(1977).
- "Design and Construction of a Phase-Locked Interference Microscope" (with G.W.Johnson), Proc.Syst.Integration & Opt.Design II - Another Look, SPIE, 103, 76-85(1977).
- "Catadioptric System with a Gradient-Index Corrector Plate", J.Opt.Soc.Am., 67, (9)1143-46(1977).
- "Design of a Single Element Gradient-Index Collimator", J. Opt. Soc. Am., 67, (9) 1134-37(1977).
- "Gradient-Index Optical Lenses" (with D.P.Ryan), The Physics Teacher, 15, (7) 409-13(1977).
- "Phase-Locked Interferometry" (with G.W.Johnson and D.C.Leiner), Clever Opt.- Innovat. Appli. of Opt., SPIE, 126, 152-60(1977).
- "Phase-Lock Interference Microscopy" (with D.C.Leiner), Proc. EOSD Symp., 726-31(1977).
- "Measurement of the Optical Properties of Gradient-Index Materials" (with D.P.Ryan), J.Opt.Soc.Am., 68, (9)1157-66(1978).
- "Real-Time Phase Microscopy using a Phase-Lock Interferometer" (with D.C.Leiner), Rev.Sci.Inst., 49, (12)1702-05(1978).

- "Large Aperture A.C. Interferometer for Optical Testing" (with R. Murray and F.B. Neves), *Appl. Opt.*, 17, (24) 3959-63 (1978)
- "Aspherical Surface Polishing with a Ring Polisher" (with G.H. Chen), *Appl. Opt.*, 18, (4) 559-62 (1979).
- "Phase-Locked Interferometry" (with G.W. Johnson and D.C. Leiner), *Opt. Eng.*, 18, (1) 46-52 (1979).
- "Interferometric Measurement of the Optical Phase Distribution for Fresnel Diffraction by a Straightedge" (with R.W. Boyd), *Appl. Opt.*, 18, (12) 2013-16 (1979).
- "Phase-Locked Moiré Fringe Analysis for Automated Contouring of Diffuse Surfaces" (with B. E. Truax), *Appl. Opt.*, 18, (1) 91-96 (1979).
- "Review of Gradient-Index Optics" (with S.D. Fantone), *Phys. Prop. of Op. Mat.*, SPIE, 204, 38-43 (1979).
- "Gradient-Index Optics: A Review", *Appl. Opt.*, 19, (7) 1035-38 (1980).
- "Chromatic Variation of Index of Refraction Gradients. Part 1" (with L. Gregorka), *Appl. Opt.*, 19, (7) 1096-1100 (1980).
- "Radial Gradient-Index Lenses with Zero Petzval Aberration" (with R.T. Salvage), *Appl. Opt.*, 19, (7) 1081-86 (1980).
- "Design of a Gradient-Index Binocular Objective" (with P.O. McLaughlin et al.), *Proc. OSA 1980 Intern. Lens Des. Conf.*, SPIE, 237, 369-79 (1980).
- "Gradient-Index Optics: A Review", *Proc. OSA 1980 Intern. Lens Des. Conf.*, SPIE, 237, 364-68 (1980).
- "Phase-Locked Moiré Fringe Analysis for Scoliosis Detection", in *Moiré Fringe Topography and Spinal Deformity*, ed. M. S. Moreland, Pergamon Press, 48-65 (1981).
- "Design of a Gradient-Index Photographic Objective" (with L. G. Atkinson et al.), *Appl. Opt.*, 21, (6) 993-98 (1982).
- "Measurement of the Chromatic Variation of Index of Refraction Gradients" (with D.P. Ryan), *Appl. Opt.*, 21, (6) 1042-51 (1982).
- "Imaging Capabilities of a Long Gradient-Index Rod", (with L.G. Atkinson and N. J. Sullo) *Appl. Opt.*, 21, (6) 1004-8 (1982).

- "Ray Tracing in Anamorphic Gradient-Index Media" (with J.M.Stagaman), *Appl. Opt.*, 21, (6)999-1003(1982).
- "Gradient-Index Optical Materials", *Proc. 2nd Intern. Otto-Schott- Kolloquium*, 193-203 (1982).
- "Optical Surfacing Center using Computer Numerical Control Machinery" (with L.G.Atkinson), *Proc. 1982 Electr. Mini-Symp.*, 72-90(1982).
- "Gradient-Index Eyepiece Design" (with J.F.Forer et al.), *Appl.Opt.*, 22, (3)407- 12(1983).
- "Rectangular Luneburg-Type Lenses for Integrated Optics" (with V.E.Wood et al.), *Opt. Ltrs.*, 8, (4)226-28(1983).
- "Gradient-Index Wide Angle Photographic Objective Design" (with L.G. Atkinson et al.), *Appl. Opt.*, 23, (11)1735-41(1984).
- "GRIN IV: gradient-index optical imaging systems", *Appl. Opt.*, 23, 1699, (1984)
- "Laser Diode to Fiber-Coupling using Anamorphic Gradient-Index Lenses" (with J.M.Stagaman), *Appl. Opt.*, 23, (11)1730-34(1984).
- "Measurement of Absolute Gradient-Index Profiles using Modulation Ellipsometry" (with N.J.Sullo), *Appl. Opt.*, 23, (11) 1765-73 (1984).
- "Gradient-Index Components", *Proc.Nat.Sci.Found.Grantees Mtng* (1984).
- "Gradient-Index in the Year 2004", *J.Non-Crys.Solids*, 73, 285-86 (1985).
- "Unusual Optical Forms," *Geometrical Optics*, SPIE 531, 256-63 (1985).
- "Gradient-Index Profile Control by Field-Assisted Ion Exchange in Glass" (with S.N.Houde-Walter), *Appl. Opt.*, 24, (24) 4288-96 (1985).
- "Measurement of the Differential Thermal Expansion and Temperature Dependence of Refractive Index in Gradient-Index Glass" (with P.O.McLaughlin), *Appl. Opt.*, 24, (24)4334-41 (1985).
- "Models for the Thermal Expansion Coefficient and Temperature Coefficient of the Refractive Index in Gradient-Index Glass" (with P.O.McLaughlin), *Appl. Opt.*, 24, (24)4342-48 (1985).
- "Model for the Chromatic Properties of Gradient-Index Glass" (with D.P. Ryan-Howard), *Appl. Opt.*, 24, (24)4356-66 (1985).

- "Photocopy Reduction Arrays: Design and Analysis" (with J.F. Goldenberg and J.J. Miceli), Appl.Opt.,24,(24)4288-96 (1985).
- "Application of Gradient-Index Lens Design Techniques to Lenses for Integrated Optics", Procs. Internatl. Lens Design Conference, SPIE 554, 319-26 (1985).
- "Preparation of Gradient-Index Glass Rods by the Sol-Gel Process" (with M.Yamane and J.B.Caldwell), Ltr.Ed.,J.Non-Cryst.Solids, 85, 244-46 (1986).
- "Image Analysis of Curved Gradient-Index Rods" (with M.J. Nadeau and J.J. Miceli), Appl. Opt.,25,(11)1780-90 (1986).
- "Design of Gradient-Index Lens Systems for Disc Format Cameras" (with J.B. Caldwell), Appl.Opt.,25,(18)3351-55 (1986).
- "Gradient Infrared Optical Material Prepared by a Chemical Vapor Deposition Process" (with M.A.Pickering and R.L.Taylor), Appl. Opt.,25,(19)3364-72 (1986).
- "Gradient-Index Binocular Objective Design" (with J.B. Caldwell, et al.), Appl.Opt.,25,(19)3345-50 (1986).
- "Delta-n Control in GRIN Glass by Additives in AgCl Diffusion Baths" (with S.N. Houde-Walter), Appl.Opt.,25,(19)3373-78 (1986).
- "Current Materials for Gradient-Index Optics," Proc.30th Ann.Intern. Tech.Symp-Opt.& Optoelect.Engin., SPIE 679, 2-6 (1986).
- "CAM Optical Fabrication System" (with L.G. Atkinson), Proc. SPIE, 676, 55-58 (1986).
- "Design, Fabrication, and Testing of a Gradient-Index Binocular Objective" (with D.S. Kindred), Proc.SPIE-Int. Soc. Opt. Eng., SPIE 766, 108-110 (1987).
- "Gradient-Index Optics" (with L. Pugliese), Photonics Spectra, March, 71-76 (1987).
- "Development of Concentration at Glass/Salt Interface in Diffusing GRIN Glass" (with S.N.Houde-Walter), J. of Non-Crystalline Solids, (99)104-112 (1988).
- "Design, fabrication, and testing of a GRIN binocular objective" (with Douglas S. Kindred), Appl.Opt.,27,(3)492-495 (1988).
- "Measurement of the refractive-index profile in polycrystalline germanium-silicon alloy GRIN crystals" (with Denis P. Naughton, and Joseph J. Miceli, Jr.), App.Opt.,27(3) 505-507 (1988).

- "Real-time index profile measurement during GRIN glass fabrication" (with Susan Houde-Walter), *App.Opt.*, 27, (3)508-515 (1988).
- "Infrared Gradient-Index Design" (with J.R. Zinter), *Photonics Spectra*, July, 117-122 (1988).
- "Radial Gradient-Index Eyepiece Design" (with J.P. Bowen, J.B. Caldwell, L.R. Gardner, N. Haun, M. Houk, D. Kindred, M. Shiba and D. Wang), *Appl. Opt.*, Volume 27, August 1988.
- "Gradient-Index Lenses: Technology Derived from Nature", *Ceramic Bulletin*, Vol. 68, No. 11, 1941-1945 (1989)
- "Gradient-Index Laser Scanning Analysis" (with Leland G. Atkinson, Debra S. Seitz, J. Robert Zinter), *SPIE*, Vol. 1079, 453-460 (1989)
- "Systematic Approach to the Design of Axial Gradient Lenses" (with David Y.H. Wang), *OSA International Lens Design Conference*, Monterey, California, June 1990.
- "Gradient-Index Profile Control from Mixed Molten Salt Baths" (with Joan E. Samuels), *Appl. Opt.*, 29(28):4042-4050 (1990).
- "Design and Tolerancing of Aspherical and Gradient-Index Germanium Singlets of Equal Performance" (with Nathalie M. Renaud), *Appl. Opt.*, Vol. 29, October 1990.
- "Axial and Radial Gradient-Index Titania Flint Glasses" (with Douglas S. Kindred and Julie Bentley), *Appl. Opt.*, 29(28):4036-4041 (1990).
- "Index Profile Control Using  $\text{Li}^+$  for  $\text{Na}^+$  Exchange in Alumino-Silicate Glasses" (with Niels Haun and Douglas Kindred), *Appl. Opt.*, Vol. 29, October 1990.
- "Third-Order Aberration Theory for Weak Gradient-Index Lenses" (with David Y. H. Wang), *Appl. Opt.*, Vol. 29, October 1990.
- "Effects of Axial and Radial Gradients on Cooke Triplets" (with C. Gary Blough, John P. Bowen, Niels Haun, Douglas S. Kindred, R. John Koshel, Daniel M. Krill, Christopher Saxer, and David Y.H. Wang), *Appl. Opt.*, Vol. 29, October 1990.
- "Computer-Based Program for Fabricating Precision Optics Integrates Design, Engineering, Manufacturing Processes, and Quality Control" (with Harvey Pollicove), *Laser Focus World*, Vol. 27, No. 3, March 1991.
- "Center for Optics Manufacturing" (with Harvey Pollicove), *Photonics Spectra*, March 1992.



- "COM: Working to Move The Optics Industry into the 21st Century" (with Harvey Pollicove), *Photonics Spectra*, May 1992.
- "Control of the radial gradient-index profile by leaching of a gel" (with Niels Haun), *Appl. Opt.*, 31(25):5225-5229 (1992).
- "Gradient Index Optics: What's the Hold-up in Applications?", *Optics & Photonics News*, Vol. 3, No. 1, November 1992, Part I.
- "Gradient Index Optics: What's the Hold-up in Applications?", *Optics & Photonics News*, Vol. 3, No. 12, December 1992, Part II.
- "Reconstruction of Surface Profiles Using Optical Differentiation and Confocal Microscopy", published in Proceedings Soc. Photo-Opt. Instrum. Eng., Vol. 2184.
- "Quantitative Phase Imaging in Confocal Microscopy by Optical Differentiation" (with A. Kulawiec), *Appl. Opt.*, Vol. 33, No. 28, October 1, 1994.
- "Roundtable: Whither Now Our Research Universities?" (with R.L. Byer, P.M. Eisenberger, K. Gottfried, L.H. Greene, D.N. Langenberg, E.J. Moniz, S.C. Solomon), *Physics Today*, March 1995.
- "Rigid Endoscopic Relay Systems: A Comparative Study" (with T.H. Tomkinson, J.L. Bentley, M.K. Crawford, C.J. Harkrider, J.L. Rouke), *Appl. Opt.*, 35:6674-6683 (1996).
- "Design of Three-Element Night-Vision Goggle Objectives" (with J.L. Rouke, M.K. Crawford, D.J. Fischer, C.J. Harkrider, and T.H. Tomkinson), *Appl. Opt.*, 37:622-626 (1998).
- "Time Varying Boundary Condition Diffusion for Gradient-Index Design" (with C. Harkrider), International Optical Design Conference Proceedings, SPIE, 3482 (1998).
- "Birefringence Measurements in Gradient-Index Rod Lenses" (with J.L. Rouke), *Appl. Opt.*, 38:6574-6580 (1999).
- "Birefringence in Gradient-Index Rod Lenses: A Direct Measurement Method and Interferometric Polarization Effects" (with J.L. Rouke), *Appl. Opt.*, 40:4971-4980 (2001).

### **Other Publications**

Automatic Computer Design Program for Systems Containing Gradient-Index Optical Components, Program 14000 cards, 140 page manual, 1978.

Applied Optics (Gradient-Index Issues) Topical Editor, 19(7) and 23(11), April 1980 and June 1984.

"Evaluation of the Optical Engineering Program at Zheijiang University, Hangzhou, PRC," for the International Advisory Panel, Chinese University Development Project, The World Bank, 1984.

"Final Report -- Hubble Independent Optical Review Panel," P-442-0078, Goddard Space Flight Center, Greenbelt, MD 20771, 1993.

### **Books**

Proceedings-1985 International Lens Design Conference, Editor (with W. H. Taylor), SPIE 554 1986.

Tutorials in Optics, Editor, (Optical Society of America, Washington, D.C.) Annual Meeting, Rochester, NY, 1987.

Selected Papers on Gradient-Index Optics, Editor, SPIE  
Milestone Series, Volume MS 67, 1993.

Gradient-Index Optics, Editor, Optical Society of America Handbook of Optics, 1994.

Gradient-Index Materials, Editor, CRC Handbook of Laser Science and Technology,  
Supplement 2: Optical Materials, 1994.

### **Presentations**

- "Design of Singlets with Continuously Varying Indices of Refraction," OSA Ann. Mtng., Miami, FL, Sept. 1970 (J.Opt.Soc.Am.60 1557).
- "Design of Corrector Plates with Gradient-Index Glasses," OSA Ann. Mtng., Denver, CO, March 1973 (J.Opt.Soc.Am.63 496).
- "Practical Aspects of A.C.Moire' Fringe Interferometry," (with J.M. Eastman) OSA Ann. Mtng., Houston, TX, Oct. 1974 (J.Opt. Soc.Am.64 1369).
- "Fabrication and Testing of Gradient-Index Components," OSA Ann. Mtng., Houston, TX, Oct. 1974 (J.Opt.Soc.Am.64 1376).
- "Current Status of Gradient-Index Optics," (Invited Paper) Intern. Lens Des. Mtng., Haverford, PA, June 1975.
- "Chromatic Dispersion in Gradient-Index Materials," (with D.P.Ryan)  
Am.Ceram.Soc.Mtng. (Glass Div.) Bedford Springs, MD, Oct. 1976.
- "Modeling and Fabrication of Gradient-Index Glass," (with S.D.Fantone and D.P.Ryan) OSA Ann. Mtng., Tucson, AZ, Oct. 1976 (J.Opt.Soc. Am.66 1111).
- "Optical Properties of Gradient-Index Materials," (with S.D.Fantone and D.P.Ryan) OSA Ann.Mtng., Tucson, AZ, Oct.1976 (J.Opt.Soc. Am. 66 1119).
- "Laser Fusion Microballoon Wall Thickness Measurements: A Comparative Study," (with G.Halpern et al.)Am.Phys.Soc.Mtng.,San Francisco, CA, Nov. 1976 (J.Appl.Phys.,48 1223).
- "Design and Construction of a Phase-Locked Interference Microscope," (with G.W.Johnson), SPIE Mtng., Reston, VA, April 1977(Proc.Syst.Integ. &Opt.Des. II-Another Look,SPIE,103 76).
- "Phase-Locked Interferometry," (Invited Paper with G.W.Johnson) Symp. for Innovation in Measure. Science, Geneva, NY, July 1977.
- "Phase-Locked Interferometry," (Invited Paper with G.W.Johnson and D.C.Leiner) SPIE Ann. Mtng., San Diego, CA, Aug. 1977 (Clever Opt.-Innovat. Appl. of Opt., SPIE 126 152).
- "A.C.Moire' Fringe Analysis," (with B.E.Trux) OSA Ann. Mtng., Toronto, Canada, Oct. 1977 (J.Opt.Soc.Am.67 1365).

- "A Large Aperture A.C. Interferometer for Optical Testing," (with R. Murray and F.B. Neves) OSA Ann. Mtng., Toronto, Canada, Oct. 1977 (J. Opt. Soc. Am. 67 1385).
- "Computer Simulation of the Optical Polishing Process," (with J.J. Bohache) OSA Annual Mtng., Toronto, Canada, Oct. 1977 (J. Opt. Soc. Am. 67 1378).
- "Dispersion Measurements in Gradient-Index Glass using A Schlieren Method," (with L. Gregorka) OSA Ann. Mtng., Toronto, Canada, Oct. 1977 (J. Opt. Soc. Am. 67 1442).
- "Evaluating Gradient-Index Fibers using Transverse Illumination," (with G.W. Johnson) OSA Ann. Mtng., Toronto, Canada, Oct. 1977 (J. Opt. Soc. Am. 67 1373).
- "High-Speed Fabrication of Aspheric Surfaces," (with G.H. Chen) OSA Ann. Mtng., Toronto, Canada, Oct. 1977 (J. Opt. Soc. Am. 67 1378).
- "Laser Fusion Microballoon Characterization using a Single Pass A.C. Interference Microscope," (with P.O. McLaughlin) OSA Ann. Mtng., Toronto, Canada, Oct. 1977 (J. Opt. Soc. Am. 67 1386).
- "Lens Design using Spherical Gradients," (with S.D. Fantone), OSA Ann. Mtng., Toronto, Canada, Oct. 1977 (J. Opt. Soc. Am. 67 1428).
- "Recent Developments in Gradient-Index Materials," (Invited Paper with S.D. Fantone) Electro Opt. 1977 Mat. Section, Anaheim, CA, Oct. 1977.
- "Refraction Index and Spectral Modeling of Gradient-Index Materials," (with S.D. Fantone) OSA Annual Meeting, San Francisco, CA, Oct. 1978 (J. Opt. Soc. Am. 68 1396).
- "Phase-Lock Interference Microscopy," (with D.C. Leiner), Electro Opt. 1977 Mat. Section, Anaheim, CA, Oct. 1977.
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- "Automated Surface Contouring using Phase-Locked Moire' Fringe Analysis," (with B.E. Truax) OSA Ann. Mtng., San Francisco, CA, Oct. 1978 (J. Opt. Soc. Am. 68 1415).
- "Comparative Study of Fiber and Wood Lens Imaging Systems," (with P.O. McLaughlin et al.) OSA Top. Mtng. Gradient-Index Opt. Imgng. Sys., Rochester, NY, May 1979.
- "Current Status of Gradient-Index Optical Systems," (Invited Paper) OSA Top. Mtng. Gradient-Index Opt. Imgng. Sys., Rochester, NY, May 1979.

- "Third-Order Aberrations of Zero Petzval Radial Gradient-Index Lenses," (with R.T.Salvage) OSA Top. Mtng. Gradient-Index Opt. Imgng. Sys., Rochester, NY, May 1979.
- "Review of Gradient-Index Systems," (With S.D.Fantone) SPIE Ann. Mtng., San Diego, CA, August 1979(Phys. Prop of Opt. Mat., SPIE, 204 38).
- "Bulk Properties of Gradient-Index Materials," Basic Opt. Prop. of Mat., Nat. Bur. Standards (NBS574) Gaithersburg, MD, May 1980.
- "Chromatic Properties of Gradient-Index Glass," Amer. Ceram. Soc., Chicago, IL, April 1980.
- "Design of a Gradient-Index Binocular Objective," 1980 Intern. Lens Des. Conf., Mills College, Oakland, CA, May 1980(Proc OSA 1980 Intern.Lens Des. Conf., SPIE, 237 369).
- "Gradient-Index Optics - A Review," (Invited Paper) 1980 Intern. Lens Des. Conf., Mills College, Oakland, CA, May 1980 (Proc OSA 1980 Intern. Lens Des. Conf., SPIE, 237 364).
- "Phase-Locked Moire' Fringe Analysis for Scoliosis Detection," A Moire' Contourography of Scoliosis, Univ. Vermont, Burlington, VT, Sept. 1980 (Moire' Fringe Topog. and Spinal Deform, ed. M.S.Moreland, Pergamon Press, 48).
- "Design of Gradient-Index Optical Systems," (Invited Paper)Top. Mtng. Gradient-Index Opt. Imgng. Sys., Honolulu, HA, May 1981.
- "Design of a Gradient-Index Photographic Objective," (with L.G.Atkinson et al.) Top. Mtng. Gradient-Index Opt. Imgng. Sys., Honolulu, HA, May 1981(Appl.Opt.,21 993).
- "Imaging Capabilities of a Long Gradient-Index Rod," (with L.G.Atkinson and N.J.Sullo)Top. Mtng. Gradient-Index Opt. Imgng Sys., Honolulu, HA, May 1981(Appl.Opt.,21 1004).
- "Ray Tracing in Anamorphic Gradient-Index Media," (with J.M.Stagaman) Top. Mtng. Gradient-Index Opt. Imgng. Sys., Honolulu, HA, May 1981 (Appl. Opt.,21 999).
- "Aberration Correction using Index Gradients," (Invited Paper) Spec. Sem. Micro-Opt. Sys., Tokyo, Japan, May 1981.
- "Pit Growth on Scuffed Bearing Surfaces," (with J.L.Lauer and S. Fung) Mtng. Amer. Phys. Soc., Dallas, TX, March 1982.
- "Comparison of Predicted and Experimental Values of Refractive-Index and Chromatic Properties of Gradient-Index Materials," (with D.P.Ryan) Gradient-Index Opt. Imgng. Sys., Spring Conf. Appl. Opt., Rochester, NY, May 1982.

- "Gradient-Index Eyepiece Design," (with J.D.Forer et al.) Gradient-Index Opt. Imgng. Sysys., Spring Conf. Appl. Opt., Rochester, NY, May 1982(Appl. Opt.,22 407).
- "Gradient-Index Optical Materials," (Invited Paper), Otto Schott Kolloquium, Jena, GDR, July 1982(Proc.OttoSchott Kolloquium, Fried.-Schiller-Univ. Jena,GDR,193).
- "Interferometer for the Measurement of Infrared Gradient-Index Materials," (with J.J.Miceli) OSA Ann. Mtng., Tucson, AZ, Oct. 1982.
- "Optical Surfacing Center using Computer Numerical Control Machinery," (with L.G.Atkinson) 14th Annual Tri-Service Conf. on Manf. Tech., Phoenix, AZ, Oct. 1982.
- "Gradient-Index Optical Systems," (Invited Paper) Opt. Soc. Southern Calif. Ann. Mtng., Hawthorne, CA, Dec. 1982.
- "Gradient-Index, Fiber, and Integrated Optics," (Invited Paper) OSA Workshop. Opt. Fab. and Test., Palo Alto, CA, Dec. 1982.
- "Bulk Gradient-Index Materials," (Invited Paper) Appl. Phys. Soc. of Japan, Kansai Chapt., Osaka, Japan, May 1983.
- "Chromatic Properties of Waveguide Lenses," (with C.B.Wooley), JSAP, OSA & ICO, 4th Top. Mtng. Gradient-Index Opt. Imgng. Sysys., Kobe, Japan, July 1983.
- "Gradient-Index Field-Assisted Ion Exchange in Glass for Gradient-Index Imaging Optics," (with S.N.Houde-Walter) JSAP, OSA & ICO, 4th Top. Mtng. Gradient-Index Opt. Imgng. Sysys., Kobe, Japan, July 1983.
- "Gradient-Index Wide Angle Photographic Objective Design,"(with L. G. Atkinson et al.)JSAP, OSA, & ICO, 4th Top. Mtng. Gradient-Index Opt. Imgng. Sysys., Kobe, Japan, July 1983(Appl. Opt.,23 1735).
- "Imaging through Curved Gradient-Index Rods,"(with M.J.Nadeau and J.J.Miceli) JSAP, OSA&ICO,4th Top.Mtng. Gradient-Index Opt.Imgng.Sysys., Kobe, Japan,July 1983.
- "Laser Diode to Fiber Coupling using Anamorphic Gradient-Index Lenses," (with J.M.Stagaman) JSAP, OSA & ICO, 4th Top. Mtng. Gradient-Index Opt. Imgng. Sysys., Kobe, Japan, July 1983(Appl. Opt.,23 1730).
- "Third Order Aberration Analysis of Gradient-Index Arrays," (with J.D.Forer and J.J.Miceli) JSAP, OSA & ICO, 4th Top. Mtng. Gradient-Index Opt. Imgng. Sysys., Kobe, Japan, July 1983.

- "Gradient-Index Optical Design," Minicourse, Xian Institute of Optics and Precision Mechanics, Xian, PRC, Sept. 1983.
- "A Year in the Japanese Optics Industry," (Invited Paper), Rochester Chapt., OSA, March 1984.
- "Gradient-Index - A Historical Perspective," (Invited Paper), 5th Top. Mtng. Gradient-Index Opt. Imgng. Sys., Monterey, CA, April 1984.
- "Optical Surfacing Center using Computer Control Machinery," (Invited Paper with L.G.Atkinson) Workshop on Opt. Fab. and Test., Monterey, CA, April 1984.
- "Radial Gradient Curved Surface for Optical Data Pickup," 5th Top. Mtng. Gradient-Index Opt. Imgng. Sys., Monterey, CA, April 1984.
- "A.C.Interferometric Techniques," Minicourse, Zhejiang Univ. Hangzhou, PRC, May 1984.
- "Gradient-Index Optical Design," Minicourse, Zhejiang Univ., Hangzhou, PRC, May 1984.
- "Optical Education in the United States and Japan," (Invited Paper) Zhejiang Univ., Hangzhou, PRC, May 1984.
- "Gradient-Index Optical Systems," (Invited Paper) Quinghua Univ., Beijing, PRC, May 1984; Appl. Phys. Soc. of Japan - Tokyo Chapt., May 1984; Hokkaido Univ., Sapporo, Japan, May 1984.
- "Unusual Optical Forms,"(Invited Paper)Los Angeles Tech.Symp.Opt. and Electro-Opt.Eng.,SPIE,January 1985 (Geomet. Opt.,SPIE, 531, 256).
- "Application of Gradient-Index Lens Design Techniques to Lenses for Integrated Optics," (with C.B.Wooley) Intern. Lens Des. Conf., Cherry Hill, NJ, June 1985 (1985 Intern. Lens Des. Conf., SPIE, 554, 319).
- "Athermalization: A Theoretical Study of Radial GRIN Lenses using Glassy Polymers," (with L.R.Gardner) 6th Top. Mtng. Gradient-Index Opt. Imgng. Sys., AEEI, JSAP & OSA, Palermo, Italy, Sept. 1985 (Grin '85 Tech. Digest,AEEI,J2).
- "Delta-n Control in GRIN Glass by Additives in AgCl Diffusion Baths," (with S.N.Houde-Walter) 6th Top. Mtng. Gradient-Index Opt. Imgng. Sys., AEEI, JSAP & OSA, Palermo, Italy, Sept. 1985 (Grin '85 Tech. Digest, AEEI, B2).
- "Design of an Axial Gradient-Index Binocular Objective," (with J.B.Caldwell et al.) 6th Top. Mtng. Gradient-Index Opt. Imgng. Sys., AEEI, JSAP & OSA, Palermo, Italy, Sept. 1985 (Grin '85, Tech.Digest, AEEI,F4).

- "Design of Optical Elements for the Ultraviolet using Radial Gradients," (with M.T.Houk) 6th Top. Mtng. Gradient-Index Opt. Imgng. Sysys., AEEL, JSAP & OSA, Palermo, Italy, Sept. 1985 (Grin '85 Tech. Digest, AEEL, J3).
- "Fabrication of Infrared Transmitting Gradient-Index Materials using Germanium/Silicon Alloys," (Invited Paper with J.J.Miceli and D.P. Naughton) 6th Top. Mtng.
- "Gradient-Index Optical Imaging Systems," AEEL, JSAP & OSA, Palermo, Italy, Sept. 1985 (Grin '85 Tech.Digest, AEEL, J1).
- "Luneburg Type Waveguide Lenses in a Three-Layer Waveguide," (with C.B.Wooley) 6th Top. Mtng. Gradient-Index Opt. Imgng. Sysys., AEEL, JSAP & OSA, Palermo, Italy, Sept. 1985 (Grin '85 Tech.Digest, AEEL, I3).
- "The Design of Gradient-Index Lens Systems for Disc Format Cameras," (with J.B.Caldwell) 6th Top. Mtng. Gradient-Index Opt. Imgng. Sysys., AEEL, JSAP & OSA, Palermo, Italy, Sept. 1985 (Grin '85 Tech.Digest, AEEL, F2).
- "A Year in Japan - The Worlds of Education in Business," Amer. Inst. Phys., Corp. Assoc. Mtng., Rochester, NY, Oct. 1985.
- "Preparation of Gradient-Index Glass Rods by the Sol-Gel Process," (with M. Yamane and J.B.Caldwell) Mat. Res. Soc. 1986 Spring Mtng., Palo Alto, CA, April 1986.
- "Current Materials for Gradient-Index Optics," (Invited Paper) 30th Ann.Intern.Tech.Symp.-Opt.&Optoelect.Eng., SPIE, August 1986, San Diego, CA (SPIE, Current Developments in Optical Engineering and Diffraction Phenomena, 679, 2-6).
- "Design, Fabrication, and Testing of a Gradient-Index Binocular Objective," (with D.S. Kindred) Optoelect.& Laser Appl. '87, SPIE, January, 1987, Los Angeles, CA
- "Fabrication of Polymer Radial-Index Gradients Utilizing a New Cross-Linking Polymer," (with L.R. Gardner), 7th Top. Mtng. Gradient-Index Optical Imgng. Systems, Reno, Nevada, January 1987 (Grin '87 Tech. Digest, ThD2).
- "Large Diameter Radial Gradient-Index Glass," (with J. B. Caldwell and D.S. Kindred), 7th Top. Mtng. Gradient-Index Optical Imgng. Systems, Reno, Nevada, January 1987 (Grin '87 Tech. Digest, ThD3).
- "Real-Time Index Profile Measurement during GRIN Glass Fabrication,"(with S.N. Houde-Walter), 7th Top. Mtng. Gradient-Index Optical Imgng. Systems, Reno, Nevada, January 1987 (Grin '87 Tech. Digest, FA2).



"Ray Tracing in Gradient-Index Materials," (Invited Paper) American Association of Physics Teachers, January 1987, San Francisco, CA.

"Fabrication and Testing of a Gradient-Index Binocular Objective," (with D.S. Kindred), 7th Top. Mtng. Gradient-Index Optical Imgng. Systems., Reno, Nevada, January 1987 (Grin '87 Tech. Digest, FB1).

"Three-Dimensional Superimposition Array," (with J.R. Zinter), 7th Top. Mtng. Gradient-Index Opt. Imgng. Systems, Reno, Nevada, January 1987 (Grin '87 Tech. Digest, FB2).

"Gradient Index Optics," (Invited Paper) Optics ECOOSA 88, March 1988, Birmingham, England.

"Gradient Index Optics," (Invited Paper) SPIE, April 6, 1988, Orlando, Florida.

"Gradient Index Optics," (Invited Paper) OSA Southern Connecticut Chapter, May 1988, Norwalk, CT.

"Interaction for Academics in the Industrial World: the U.S. and Japan," (Invited Paper) OSA, August 15, 1988, San Diego, CA.

"Infrared Gradient Index Design and Materials," (Invited Paper) OPTCON '88, November 1988, Santa Clara, CA.

"Practical F/1 Infrared Gradient Index Objective," (with J.R. Zinter) OPTCON '88, November 1988, Santa Clara, CA.

"Effective Research and Development in Electro-Optics," (Invited Paper) University of North Carolina at Charlotte, September 1988, Charlotte, NC.

"Effects of Axial and Radial Gradients on Cooke Triplets," (with C. G. Blough, J. P. Bowen, J. B. Caldwell, S. Chuang, L. R. Gardner, N. Haun, M. T. Houk, D.S. Kindred, R. J. Koshel, D. Krill, N. M. Renaud, C. E. Saxer, and D.Y. H. Wang) MOC/GRIN '89 Tokyo Conference.

"Index Profile Control Using  $\text{Li}^+$  for  $\text{Na}^+$  Exchange in Alumina Silicate Glasses," (with N. Haun, D. Kindred, and L. Surovick) MOC/GRIN '89 Tokyo Conference.

"Third Order Aberrations of Weak Gradient-Index Lenses," (with D.Y.H. Wang) MOC/GRIN '89 Tokyo Conference.

"Radial Gradient  $\text{TiO}_2$  Flint Glass  $\text{Li}^+$  - $\text{Na}^+$  Exchange and  $\text{Na}^+$  - $\text{Li}^+$  Exchange," (with D.S. Kindred) MOC/GRIN '89 Tokyo Conference.

- "Use of Microoptical Lenses Fabricated by Chemical Vapor Deposition," (with J.P. Bowen) MOC/GRIN '89 Tokyo Conference.
- "Measurement of Chromatic Properties of Gradient Index Glasses: Method and Results," (with C. E. Saxer) MOC/GRIN '89 Tokyo Conference.
- "Gradient Index Optics" (Invited paper), ESSILOR - Paris, France, November 1989.
- "Technical Optical Entrepreneurship" (Invited Paper), Copenhagen, Denmark, November 1989.
- "Gradient Index Optics" (Invited Paper), Rolls Royce - London, England, November 1989.
- "Sol-Gel Performance" (Invited Paper), Gorham Advanced Materials Institute, Marco Island, Florida, December 1989.
- "Gradient-Index Lenses: Technology Derived from Nature," (Ceramic Bulletin, Vol. 68, No. 11, 1989).
- "Gradient-Index Laser Scanning Lens Analysis," (with L.G. Atkinson, D. Seitz, and J.R. Zinter) SPIE, Vol. 1079, Hard Copy Output, 1989.
- "Practical Infrared Gradient Index Optics," (with J.R. Zinter, L.G. Atkinson, and K. A. Mitchell) 1989.
- "Gradient-Index Optics & Equivalence to Other Areas of Physics," (Invited Paper) Optical Society of Southern California, May 1990.
- "Journées Nationales d'Optique Guidee," (Invited Paper), Transinnova, Bihorel, France, October 1990.
- "Gradient Index Materials in Manufacturing," (Invited Paper) OSA Ann. Mtg., Boston, MA, November 1990.
- "Control of the Radial Gradient-Index Profile Using the Sol-Gel Process," (with Niels Haun) 9th Top. Mtng., Gradient-Index Optical Systems, Monterey, CA, April 1991.
- "Design and Fabrication of a Gradient Index Compact Disk Objective," (with Julie L. Bentley and Douglas S. Kindred) 9th Top. Mtng., Gradient-Index Optical Systems, Monterey, CA, April 1991.
- "Paraxial Chromatic Aberrations of Weak Axial Gradient Index Lenses," (with David Y.H. Wang) 9th Top. Mtng., Gradient-Index Optical Systems, Monterey, CA, April 1991.

- "Hubble Space Telescope - Cure," (Invited Paper) Optical Society of America, Washington, DC, May 1991.
- "Gradient-Index Optics," (Invited Talk) Korean Academy of Industrial Technology (KAITECH), Seoul, Korea, May 1991.
- "Process Science Development at the Center for Optics Manufacturing," (with Harvey M. Pollicove and Donald Golini), SPIE, San Diego, CA July 1991.
- "Technology Development at the Center for Optics Manufacturing," (with Harvey M. Pollicove), SPIE, San Diego, CA, July 1991.
- "Optics in Nature: Interesting Students In Optics," (Invited Talk) St. Petersburg, U.S.S.R., October 1991.
- "Findings of the Hubble Independent Optical Review Panel," University of Rochester, Laser Laboratory for Energetics (Invited Talk), October 1991.
- "Control of the Radial Gradient-Index Profile by Leaching of a Gel," (with Niels Haun) SPIE, San Diego, CA, July 1992.
- "Novel Gradient Index Glasses," Gordon Research Conference, "Optical Phenomena in Glass," (Invited Talk) Tilton, New Hampshire, July 1992.
- "Technology Development at the Center for Optics Manufacturing," (with Harvey M. Pollicove) SPIE, San Diego, CA, July 1992.
- "New Interferometer for Measuring Chromatic Dispersion of Gradient-index Materials," (with Christopher E. Saxer) Tenth Topical Meeting on Gradient-index Optical Systems, Santiago, Spain, October 1992.
- "Harmonic Phase Shifting Interferometry," (with Christopher E. Saxer) OSA Optical Fabrication and Testing Workshop, Boston, MA, November 1992.
- "Reality in Gradient Index Optics," (Optics & Photonics News, Vol. 3, No. 12, December 1992).
- "Introduction to Gradient-Index Optics - Use in Nature and Optical Systems," (Invited Talk) American Chemical Society, 205th ACS National meeting, Denver, CO, March 1993.
- "Technical Advances in Process Science Research at the Center for Optics Manufacturing," (with S.D. Jacobs, A. Lindquist, M.J. Cumbo, B. Puchebner, A. Feltz, W. Czajkowski, D. Golini, J. Greivenkamp, and H.M. Pollicove) Submitted to the

Seventh International Precision Engineering Seminar to be held in Kobe, Japan, May 1993.

"Phase Imaging in Confocal Microscopy by Optical Differentiation," (with Andrew Kulawiec) OSA Ann. Mtg. Toronto, Canada, October 1993.

"Design of Optical Systems with Negative Gradient-Index Dispersion," MOC/GRIN '93 Eleventh Topical Meeting on Gradient-Index Optical Systems, Tokyo, Japan, October 1993

"Reconstruction of Surface Profiles Using Optical Differentiation and Confocal Microscopy," (with Andrew Kulawiec) SPIE, San Jose, CA, February 1994.

"Zoom Lens Design Using Gradient-Index Lenses," (with Masaharu Deguchi) SPIE, San Jose, CA, February 1994.

"A Year in Washington, DC," LEOMA Executive Seminar, Washington, DC February 1994.

"Li<sup>+</sup> for Na<sup>+</sup> and Na<sup>+</sup> for Li<sup>+</sup> Ion Exchange in Alumina Borate Glasses," (with Julie L. Bentley, Jennifer L. Rouke, Douglas S. Kindred) OSA Gradient Index Optical Systems Topical Meeting, Rochester, NY, June 1994.

"Twenty-five years of GRIN Optics," Invited talk GRIN '94, June 1994.

Invited talk, "Congress, Science, and Engineering Funding," at Emerging Priorities: The Needs, Scope and Future of the New York State Glass Industry, Corning, NY, September 1994.

"Washington Experiences of a Scientist," Invited Talk, OSA Corporate Associates, October 1994.

"Gradient Index Optical Manufacturing," Invited Talk, 55th Conference on Glass Problems, Columbus, Ohio, Sponsored by the Departments of Materials Science and Engineering, The Ohio State University and The University of Illinois at Urbana-Champaign, November 1994.

"The Making of Science Policy in a Senate Office," American Physical Society meeting, San Jose, CA, March 1995.

"Science, Technology and the U.S. Congress: Is There Any Connection?", Optical Society of America, Los Alamos, NM, March 1995.

"Science, Technology and the U.S. Congress: Is There Any Connection?", Optical Society

of America, Albuquerque, NM, March 1995.

“Gradient Index Optics”, Physics Department, New Mexico State University, Los Cruces, NM, March 1995.

“Science, Technology and the U.S. Congress: Is There Any Connection?”, Optical Society of America, Los Cruces, NM, March 1995.

“Science, Technology and the U.S. Congress: Is There Any Connection?”, Optical Society of America, Huntsville, AL, May 1995.

- “Science, Technology and the U.S. Congress: Is There Any Connection?”, Optical Society of America, Boulder, CO, May 1995.
- “Rigid Endoscopic Relay Systems: A Comparative Study” (with Todd Tomkinson), Optical Society of America annual meeting, Portland, OR, September 1995.
- “Tolerances in Axial Gradient-Index Lenses” (with Mary Kate Crawford), Optical Society of America annual meeting, Portland, OR, September 1995.
- “Design of Gradient-Index Lens Systems using Manufacturing Parameters” (with Julie Bentley), Optical Society of America annual meeting, Portland, OR, September 1995.
- “Modeling  $\text{Li}^+$  for  $\text{Na}^+$  Ion Exchange in Aluminosilicate Glasses Using a Modified Quasi-Chemical Diffusion Coefficient” (with Julie Bentley), Optical Society of America annual meeting, Portland, OR, September 1995.
- “Science, Technology and the U.S. Congress: Is There Any Connection?”, Rochester Section of the Optical Society of America and the Rochester Chapter of the Society for Imaging Science and Technology, Rochester, NY, October 1995.
- “Gradient Index Optics -- Natural and Manmade”, Southwestern Ontario Section of the Optical Society of America, Waterloo, Ontario, October 1995.
- “Science, Technology and the U.S. Congress: Is There Any Connection?”, New England Section of the Optical Society of America, Boston, MA, November 1995.
- “Gradient Index Optics”, Workshop on Research and Education in Optical Science and Engineering, sponsored by the NCR Committee on Optical Science and Engineering, Irvine, CA, January 1996.
- “Gradient Index Lens Systems with Negative Dispersion”, First Meeting of the Tokyo Section of the Optical Society of America, Tokyo, Japan, April 1996.
- “Gradient Index and Endoscopy”, Urologic Scientific Symposium: Festschrift for Dr. Abraham T.K. Cockett, University of Rochester School of Medicine & Dentistry, Rochester, NY, May 1996.
- “Trends and Directions in Federal Funding” (panel discussion), University of Connecticut, Storrs, CT, May 1996.
- “Graded Index Optical Materials”, International Symposium on Optical Science, Engineering, and Instrumentation, Annual Meeting of SPIE, The International

Society for Optical Engineering, Denver, CO, August 1996.

“Current State of the Art in Gradient Index Optics”, Carl Zeiss, Oberkochen, Germany,  
September 1996.

- “Gradient-Index Optics”, St. Petersburg Institute of Fine Mechanics and Optics, Technical University, St. Petersburg, Russia, September 1996.
- “Gradient-Index Profile Modification” (with Curtis Harkrider), Optical Society of America annual meeting, Rochester, NY, October 1996.
- “Design of Night Vision Goggle Objectives Using Aspheres, Holographic Optical Elements, and Gradient-Index Materials” (with Jennifer Rouke), Optical Society of America annual meeting, Rochester, NY, October 1996.
- “Design and Manufacture of Gradient Index Optical Systems”, Instituto Nacional de Astrofisica Optica y Electronica, 25th anniversary celebration, Puebla, Mexico, November 1996.
- “GRIN Optics”, Industrial Technology Research Institute, Chutung Hsinchu, Taiwan, January 1997.
- “What Went Wrong with the Hubble Telescope?”, Rochester Section of The Optical Society of America and the Society of Physics Students, Rochester, NY, February 1997.
- “Gradient Index Optics”, National Capital Section of The Optical Society of America, McLean, VA, April 1997.
- “University-Industry Collaboration: Problems and Opportunities”, Round Table on High-Level Innovation, Ministry of Research and Information Technology, Copenhagen, Denmark, May 1997.
- “Gradient Index Optical Manufacturing”, Southwestern Connecticut Section of The Optical Society of America, Danbury, CT, May 1997.
- “Gradient Index Optical Manufacturing”, Quebec Section of The Optical Society of America, Quebec City, Canada, June 1997.
- “Gradient Index Design-for-Manufacturing Using Time Varying Boundary Condition Diffusion” (with C.J. Harkrider), The Optical Society of America, Annual Meeting, Long Beach, CA, October 1997.
- “Time Varying Boundary Condition Diffusion for GRIN Lens Profile Control” (with C.J. Harkrider), MOC/GRIN ‘97, Tokyo, Japan, October 1997.
- “Progress in GRIN Optics and Related Technology”, plenary talk, MOC-GRIN ‘97, Tokyo, Japan, October 1997.



"High-Quality - Low-Cost Endoscopes", Rochester Engineering Society, Rochester, NY, November 1997.

"Planning Public Policy in Science and Technology: A UR Professor Goes to Washington", Downtown Community Forum, Rochester, NY, April 1998.

University of Rochester's 148th Commencement Address, Rochester, NY, May 1998.

"Time Varying Boundary Condition Diffusion for Gradient-Index Design" (with C. Harkrider), International Optical Design Conference, Kona, Hawaii, June 1998.

"Time Varying Boundary Condition Diffusion for Manufacturable Gradient-Index Lens Design" (with C. Harkrider), Optical Society of America Annual Meeting, Baltimore, MD, October 1998.

"Birefringence Measurements in Gradient-Index Rod Lenses" (with J.L. Rouke), Optical Society of America Annual Meeting, Baltimore, MD, October 1998.

"Design and Manufacture of a Gradient Index Axicon" (with D.J. Fischer and C.J. Harkrider), Optical Society of America Annual Meeting, Santa Clara, CA, October 1999.

"How Investment Should be Made in Science and Technology – A Case Study of Nanotechnology", plenary address, Japan Society for Precision Engineering, Tokyo, Japan, March 2001.

"Establishing Priorities in Science and Technology", The 2001 Melvin R. Lohmann Lecture, College of Engineering, Architecture and Technology, Oklahoma State University, Stillwater, OK, April 2001.

"Science Policy in the Clinton Administration", Intellectual Property in the Veterans Administration Conference, Arlington, VA, April 2001.

"Challenges to Innovation in the U.S.", Photonics in the Forest – The Fitzpatrick Center for Photonics and Communication Systems Convocation, Duke University, April 2001.

"Industrial R&D and Federal Science and Technology Policies", American Association for the Advancement of Science Colloquium on Science & Technology Policy, Washington, DC, May 2001.

"Perspective from Washington", Rochester Intellectual Property Law Association, Rochester, NY, May 2001.

- "Perspective from Washington", Association of University Anesthesiologists Annual Meeting, Rochester, NY, May 2001.
- "Federal S&T Policy – The Bush and Clinton Years" (panel moderator), Office of Science and Technology Policy 25<sup>th</sup> Anniversary Symposium, Massachusetts Institute of Technology, Cambridge, MA, May 2001.
- "U.S. Science Policy", Workshop on the Interface of Science and Government – How Scientific Information is Used by Government Policymakers, sponsored by the AAAS Science and Technology Policy Fellowship Programs and the Swiss government, June 2001.
- "Biomedical Engineering and Federal Policy", Biomedical Engineering Research Conference of The Whitaker Foundation, LaJolla, CA, August 2001.
- "The Current Status of Photonics in the USA", International Photonics Technology Conference 2001, organized by the Optical Society of Korea and the Korea Association for Photonics Industry Development, Kwangju, Korea, September 2001.
- "Establishing Federal Priorities in Science and Technology", U.S. Department of Veterans Affairs National Research and Development Meeting, Keystone, CO, October 2001.
- "Science and Technology Policy in the U.S.", Mentor Training Seminar, Center for Innovation Policy Research and Education for Central and Eastern Europe, Budapest, Hungary, November 2001.
- "Federal Priorities in Science and Technology", Rotary Club, Perry, NY, November 2001.
- "Center of Excellence in Photonics and Microsystems, Rochester, NY", The Foundation for Scientific and Industrial Research at the Norwegian Institute of Technology", Oslo, Norway, January 2002.
- "S&T Policies: Challenges of Globalization", Confederation of Norwegian Business and Industry (NHO) Annual Conference, Oslo, Norway, January 2002.
- "Center of Excellence for Infotonics", High Technology of Rochester Board of Directors, Rochester, NY, February 2002.
- "Twenty-First Century Science and Technology Policy and the Relevance of K-12 Education", CTY Conference for Educators, Johns Hopkins University Center for Talented Youth, Ellicott City, MD, March 2002.
- "Twenty-First Century Science and Technology Policy", University of Maine, Orono, ME, April 2002.

- "Center of Excellence for Infotonics", Department of Electrical Engineering Seminar Series, University at Buffalo, Buffalo, NY, April 2002.
- "National Initiatives in Nanoscience and Technology: Challenges to Innovation in the U.S.", Edward Orton, Jr. Memorial Lecture, American Ceramic Society Annual Meeting, St. Louis, MO, April 2002.
- "Establishing Federal Priorities in Science and Technology", Optical Fabrication and Testing Topical Meeting, The Optical Society of America, Tucson, AR, June 2002.
- "Design Methods for Gradient-Index Progressive Addition Lenses" (with David Fischer), International Optical Design Conference (IODC), Tucson, AR, June 2002.
- "Industry/Academia/Government Partnerships: The Center of Excellence for Infotonics", NY-Nanotech 2002, UNY-VAC – Upstate New York Chapter of the American Vacuum Society, Troy, NY, August 2002.
- "U.S. Initiatives for Improving the Quality of Life Using Optics", Ninth Congress of the International Commission for Optics: Optics for the Quality of Life, Florence, Italy, August 2002.
- "Impact of the National Initiative on Optics and Photonics and its Relevance to Workforce Issues", Stanford Photonics Research Center Annual Meeting, Palo Alto, CA, September 2002.
- "Continued Economic Growth and its Barriers", ASM/TMS Distinguished Lecture in Materials and Society, ASM Annual Event, Columbus, OH, October 2002.
- "Future Trends in Technology and the Workforce", Future Vision: The Next Generation Optoelectronics Technologies and Markets, Optoelectronics Industry Development Association, Fairport, NY, October 2002.
- "An Academic in Washington: The Best of Both Worlds Establishing Federal Priorities in Science and Technology", Manhattan College Sesquicentennial Jubilee, Riverdale, NY, November 2002.
- "The Making of Federal Science and Technology Policy", Rochester Chapter of the Optical Society of America, Rochester, NY, November 2002.
- "Infotonics", Digital Rochester: Knowledge Upgrade Series V.4, Rochester, NY, December 2002.
- "Center of Excellence", Rochester Regional Advisory Board, Rochester, NY, December 2002.

"The Future of Science is Not Along the Disciplinary Axis", American Association for the Advancement of Science Annual Meeting, Denver, CO, February 2003.

"Influencing Congress' Understanding of Science and Technology", American Association for the Advancement of Science Annual Meeting, Denver, CO, February 2003.

"Funding Opportunities", Forum on Optical Sensing for Homeland Security, Optical Society of America, Washington, DC, February 2003.

### **Patents**

"Optical System Comprising a Singlet Element having a Continuously Varying Index of Refraction", U.S. Patent 3,729,253, April 24, 1973.

"Telecentric Lens System", U.S. Patent 3,773,404, November 20, 1973.

"Optical Disc Pickup Lens", Japanese Patent 58-122512, July 21, 1983.

"Spherical Gradient-Index Lens Designs for Video-Disk Pickup Lens or the Like", U.S. Patent 4,457,590, July 3, 1984.

"Method and Composition for Creating Gradient-Index Glass", U.S. Patent 4,756,733, July 12, 1988.

"Universal Lens Polishing Tool, Polishing Apparatus and Method of Polishing", U.S. Patent 4,768,308, September 6, 1988.

"Sol-Gel Method for Making Gradient-Index Glass", U.S. Patent, 4,797,376, February, 1989.

"Composite Gradient Index and Curved Surface Anamorphic Lens and Applications", U.S. Patent 4,900,138, February, 1990.

"Gradient Index Glass", U.S. Patent 4,902,650, February, 1990.

"Sol-Gel Method for Making Gradient-Index Optical Elements," U.S. Patent 5,068,208, November, 1991.

"Gradient-Index of Refraction Optical Data Storage Lens" (with Daniel M. Krill), U.S. Patent 5,161,063, November, 1992.

"Negative Abbe Number Radial Gradient Index Relay and Use of Same" (with Douglas Kindred), U. S. Patent 5,361,166, November, 1994.

"Riflescope Utilizing Gradient Index Lenses" (with Leland G. Atkinson and George Nadorff), U.S. Serial No. 983953, June, 1994.

"Negative Abbe Number Radial Gradient Index Relay, Method of Making, and Use of Same" (with Leland G. Atkinson et al), U.S. Patent 5,457,576, October, 1995.

"Negative Abbe Number Radial Gradient Index Relay, Method of Making, and Use of Same" (with Douglas S. Kindred et al), EPO 00624209, 1997.

### **Advisees and Thesis Topics**

#### **Masters Candidates (completed)**

- Dennis C. Leiner (1977)  
Phase-Lock Interference Microscopy
- Fernando B. Neves (1977)  
Large Aperture A. C. Interferometry
- Lisa Gregorka (1978)  
Measurement of the Chromatic Dispersion of Gradient Refractive Index Glass using a Schlieren Technique
- Bruce E. Truax (1978)  
Phase-Locked Moire' Fringe Analysis for Automatic Contouring of Diffuse Surfaces
- Robert P. Herloski (1979)  
Measurement of Ultrasmall Displacement
- Robert T. Salvage (1979)  
Third Order Aberration Study of Radial Gradient Lenses with Zero Petzval Curvature and Spherical Gradient Lenses
- Karen D. Jacobsen (1980)  
Three-Dimensional Moire' Contouring using Phase-Locked Interferometry
- Danette P. Ryan (1980)  
Measurement of the Chromatic Dispersion of Gradient-Index Materials by Multiple Wavelength A. C. Interferometry
- Susan N. Houde-Walter (1983)  
Field-Assisted Ion Exchange in Glass
- Thomas F. Powers (1983)  
Interferometric Measurement of Transparent Solids
- Ronald D. Stern (1983)  
Three-Dimensional Contouring by Additive Topography
- Nancy J. Sullo (1983)  
Measurement of Absolute Refractive Index Profiles in Gradient-Index using Modulation Ellipsometry

Jill D. Forer (1984)

Third Order Aberration Analysis of Gradient-Index Arrays

Mary J. Nadeau (1984)

Aberration Analysis of Curved Gradient-Index Imaging Rods

Denis P. Naughton (1986)

Fabrication and Testing of Infrared Gradient-Index Materials

Robert J. Zinter (1987)

A Three Dimensional Super Position Array

Joan Samuels (1989)

Influence of the Molten Salt Bath on Ion Exchange in Glass and The Gradient-Index Profile

Daniel Krill (1990)

Axial and Radial Index Gradients Optical Data Storage Lenses

Laurie Scheffel (1990)

Dispersion Measurement of Infrared Grain Materials

Mark Wittman (1990)

High-Precision Characterization of Inertial-Fusion Targets Using Scanning Fabry-Perot Interferometry

Michael Hoppe (1992)

Design of Axial Gradient Singlets Utilizing a Fickian Diffusion Model

### **Doctoral Candidates (completed)**

Gih-Horng Chen (1977)

High-Speed Fabrication of Aspherical Surfaces

James J. Bohache (1978)

Study of the Optical Polishing Process

Stephen D. Fantone (1979)

Design, Engineering, and Manufacturing Aspects of Gradient--Index Optical Components

Glen W. Johnson (1979)

Measurement of Strongly Refracting Three-Dimensional Distributions

- David Lees (1979)  
Frustrated Total Reflection Polarizing for the Infrared
- Joel L. Seligson (1981)  
The Optical Field in the Focal Region of an Aberrated Lens
- Paul O. McLaughlin (1983)  
Thermal Expansion and Temperature Dependence of the Refractive Index in Gradient Refractive Index Glasses
- Joseph J. Miceli (1983)  
Infrared Gradient-Index Optics: Materials, Fabrication, and Testing
- Danette P. Ryan (1983)  
Chromatic Properties of Index of Refraction Gradients in Glass
- Joan M. Stagaman (1985)  
Anamorphic Gradient-Index Lens Systems
- Leland G. Atkinson III (1986)  
High Speed Fabrication of Aspheric Surfaces
- Susan N. Houde-Walter (1987)  
Profile Control in Gradient-Index Glasses
- C. Benjamin Wooley (1989)  
Design and Fabrication of Luneburg-Type Waveguide Lenses
- J. Brian Caldwell (1989)  
Sol-Gel Methods for Making Radial Gradient-Index Glass
- Leo R. Gardner (1989)  
Studies in Gradient Index Polymer Materials
- Michael T. Houk (1990)  
Fabrication & Testing of Index Gradients in Fluorite Materials
- Douglas S. Kindred (1991)  
Development of New Gradient-Index Glasses for Optical Imaging Systems
- John P. Bowen (1991)  
Radial Gradient Lenses for Single-Mode Optical Systems



C. Gary Blough (1992)  
Single Point Diamond Turning of Glass

David Wang (1992)  
Design Methods for Gradient Index Imaging Systems

Niels Haun (1993)  
Effect of Diffusion Chemistry on Gradient Index Profiles formed via Sol-Gel

Andrew Kulawiec (1994)  
Quantitative Phase Imaging in Scanning Optical Microscopy

Julie Bentley (1995)  
Integration of the Design and Manufacture of Gradient-Index Optical Systems

Christopher Saxer (1997)  
Interferometric Characterization of the Chromatic Dispersion of Gradient-Index Glasses

Curtis Harkrider (1999)  
Design-for-Manufacture of Gradient-Index Optical Systems Using Time-Varying Boundary Condition Diffusion

Mary Kate Crawford (1999)  
Tolerance Analysis of Axial Gradient-Index Lenses

Jennifer Rourke (2000)  
Birefringence in Gradient-Index Materials

Paul Murphy (2000)  
Interferometric Metrology of Aspheric Surfaces

David Fischer (2002)  
Gradient-Index Ophthalmic Lens Design and Polymer Material Studies

**Doctoral Candidates (in process)**

Gregory Schmidt  
Polymer Gradient Index Optics

Yanqiao Huang  
Built-In Accommodation System for the Eye

**Principal Investigator on Grants and Contracts**

"Rationalization of Manufacturing Methods in Optical Fabrication" Frankford Arsenal, Philadelphia, PA July 1974 - September 1975	\$ 39,900
"Gradient-Index Optical Glass Lenses" National Science Foundation, Washington, D. C. July 1974-December 1976	\$127,000
"A. C. Interference Microscope" Laboratory for Laser Energetics, Rochester, NY July 1975 - June 1977	\$ 37,620
"A. C. Interference Microscopy for Cystoscopy" American Cystoscope Makers, Inc, Stamford, CT July 1975 - June 1977	\$ 40,230
"Large Aperture A. C. Interferometer" Laboratory for Laser Energetics, Rochester, NY December 1975 - June 1977	\$ 76,492
"Engineering Aspects of Gradient-Index Optical Systems" National Science Foundation, Washington, D. C. July 1976 - December 1978	\$145,000
"Phase Lock Interference Microscope" subcontract to RIAS National Science Foundation, Washington, D. C. July 1977 - July 1978	\$ 20,000
"Program Concepts for Gradient-Index Optical Systems" Redstone Arsenal, Huntsville, AL May 1978 - September 1978	\$ 9,950
"Gradient-Index Optical Systems" National Science Foundation, Washington, D. C. July 1978 - December 1981	\$214,460
"Gradient-Index Lens Design" Redstone Arsenal, Huntsville, AL October 1978 - December 1979	\$ 54,825

"Gradient-Index Topical Meeting"	
National Science Foundation, Washington, D. C.	
April 1979 - March 1980	\$ 3,500
"Independent Research Project"	
General Dynamics Corporation, Pomona, CA	
1979 - 80	\$ 42,000
1980 - 81	\$ 32,000
1981 - 82	\$ 34,650
1982 - 83	\$ 20,345
"IR Properties of Gradient-Index Materials"	
Redstone Arsenal, Huntsville, AL	
June 1980 - June 1981	\$ 59,960
"Optical Surfacing using a Computer Numerical Control Machine"	
Picattiney Arsenal, Dover, NJ	
September 1980 - August 1983	\$333,011
"Gradient-Index Aerial Photographic Lens"	
Jet Propulsion Laboratory, Pasadena, CA	
February 1981 - September 1981	\$ 6,500
"Gradient-Index Topical Meeting"	
National Science Foundation, Washington, D. C.	
May 1981 - October 1981	\$ 3,500
"Gradient-Index Lens Research"	
Redstone Arsenal, Huntsville, AL	
August 1981 - May 1982	\$ 66,925
"Gradient-Index Pilot Project"	
Picatinny Arsenal, Dover, NJ	
September 1981 - August 1984	\$417,000
"Gradient-Index Optical Systems"	
National Science Foundation, Washington, D. C.	
November 1981- December 1984	\$220,209
"Non-Interferometric Methods of Measuring Gradient-Index Profiles"	
Xerox Corporation, Rochester, NY	
July 1982 - August 1982	\$ 8,000

"Study for Integrated Optics Spectrometer"	
Jet Propulsion Laboratory, Pasadena, CA	
December 1982 - September 1983	\$ 4,500
"Graded-Index and Multisegmented Optics Research"	
Redstone Arsenal, Huntsville, AL	
December 1982 - September 1983	\$176,216
"Optical System Engineering and Software at Jet Propulsion Laboratory"	
Jet Propulsion Laboratory, Pasadena, CA	
June 1984 - August 1984	\$ 19,000
"Center for Advanced Optical Technology"	
New York State Science and Technology Foundation	
September 1983 - present	\$ 75,000
"Gradient-Index Optical Systems"	
National Science Foundation, Washington, D. C.	
July 1985 - June 1986	\$ 55,000
"Gradient-Index Optical Systems"	
Army Research Office, Research Triangle Park, NC	
July 1985 - July 1988	\$515,894
"Studies in Gradient-Index Plastics"	
Dow Chemical Company, Midland, MI	
January 1986 - June 1989	\$ 93,713
"Gradient-Index Optical Systems"	
National Science Foundation, Washington, D. C.	
September 1986 - August 1989	\$266,932
"Opto-Electronic Systems Research"	
Army Research Office, Research Triangle Park, NC	
October 1986 - September 1988	\$161,291
"Design of Gradient-Index Eyepieces"	
Jet Propulsion Laboratory, Pasadena, CA	
December 1986 - October 1987	\$ 4,500
Director, New York State Center for Advanced Optical Technology	
Principal Investigator, July 1987 - 1994	\$1,800,000 /yr

Principal Investigator, Center for Optics Manufacturing	\$4,600,000
TLD/Laser Beam Thermal Interaction Project R0691, RG&E	\$ 7,500
"Research on Optical Manufacturing" July 1992 - June 1997	\$1,583,530
"Optimod" DOD/Army September 1992 - August 1995	\$1,100,000
"Optical Manufacturing Issues in Gradient & Diffractive Optics" September 1992 - November 1995	\$ 300,000
"Glass Micro-Optics" National Science Foundation (with Professor Susan Houde-Walter)	\$ 40,000
"Design and Characterization of an Infrared Endoscope" US-Mexico Foundation May 1995 - July 1997	\$ 70,000
"Design of Optical Systems and Metrology of Components for Projection Lithography" Semiconductor Research Corporation August 1996 - December 1997	\$ 290,000

### **Administrative Responsibilities**

#### The Institute of Optics

Graduate Committee	1974-1982, 1984, 1985
Chairman	1979-80
Ad Hoc Committee on Development	1975-77
Responsible for Departmental Computing Funds (\$12,000/year)	1975-82
Responsible for Optical Fabrication Facility Annual Budget (1977) \$120,000	1975-83
Space and Facilities Committee	1984
Masters Co-Op Program Coordinator	1981-82, 1984-85
Steering Committee	1984-86
Undergraduate Committee	1985-86
Hopkins Chair Search Committee	2001-02

#### College/School of Engineering and Applied Science

Research Facilities Committee	1975-79
Director Search Committee, Institute of Optics	1977-81
Graduate Committee	1979-83
Chairman	1982-83
Biomedical Engineering Executive Committee	1979-93
Faculty Secretary	1984-86

#### University of Rochester

Computer Center Advisory Committee	1977-80
Undergraduate Teaching Committee	1981-82
Review Committee - Laboratory for Laser Energetics	1980-82
Review Committee - Deanship of the College of Engineering	1980
Academic Computing Steering Committee	1984
Ad Hoc Committee on Parking	1984
Dean Search Committee, College of Engineering	1984-85
University Committee on Tenure and Privileges	1984-86
Faculty Senator	1985-92
Executive Committee	1986-87, 90, 91, 92
Research Policy Committee	1986-87
Budget Committee	1991, 92

#### Monroe Community College

Optical Technology Advisory Committee

1994-1995

### **Professional Activities**

Amarel Precision Instruments, Inc.

Board of Directors, 1996-97  
Technical Advisory Committee, 1997

American Association of Engineering Societies

Board of Governors, 1995-97

American Ceramic Society (Glass Division), 1977-91

American Institute of Physics

Governing Board, 1994-98  
Executive Committee of the Board, 1995-97  
Committee for Public Policy, 1994-97  
Committee on Committees, 1994-97  
State Department Fellowship Selection Committee, 2001-02

The American Physical Society

Selection Committee for the Congressional Scientist Program, 1995  
Panel on Public Affairs, 1995-96  
Forum on Physics and Society, 1996  
Executive Committee, 1996-97

American Society for Engineering Education, Engineering Deans Council

Public Policy Committee, 1995-97

American Society for Precision Engineering, 1989-present

Association of Engineering Colleges in New York State, 1995-97

Coalition for Photonics and Optics, Chair, 1996-97

Council of Scientific Society Presidents

Co-Chair, Government Affairs Committee, 1996-97

Gradient Lens Corporation

Board of Directors, 2001-

IEEE Lasers and Electro-Optics Society, 1989-present

Industrial Research Institute

Academic Advisory Council of the University Relations Committee, 2001-present



Pre-College Education Subcommittee, 2001-present

International Commission on Optics

Delegate, 1979-82  
Program Committee, 1987 meeting  
International Advisory Committee, 1998 meeting  
International Advisory Committee, Fifth International Topical Meeting on Education and Training in Optics, 1997

Maine Science and Technology Foundation

Board of Directors, 2002-present

Materials Research Society, 1984-present

National Aeronautics and Space Administration (NASA)

Goddard Space Flight Center Visiting Committee, 2002-  
Goddard Space Flight Center Applied Engineering and Technology Directorate Visiting Committee, 2002-  
Review of the Next Generation Space Telescope, 2002-

National Research Council, 1988-present

U.S. National Committee for the International Commission for Optics  
Board of Physics and Astronomy, 1988  
Committee on Optical Sciences and Engineering, 1995  
Instrumentation and Laboratory Improvement Initiative, 1995  
Board on Assessment of NIST Programs, 2001-  
Panel for Physics of the Board on Assessment of NIST Programs:  
Vice Chair, 2001-2002  
Chair, 2002-2004  
Steering Committee, Capitalizing on Science, Technology, and Innovation: An Assessment  
of the Small Business Innovation Research Program, 2002-2005

The New York Photonics Development Corp.

Board of Directors, 1992

Optical Society of America

Gradient-Index Optical Imaging Systems Topical Meetings:  
May 1979 - Rochester, NY (Co-Chairman)  
May 1981 - Honolulu, HA (Chairman)  
May 1982 - Rochester, NY (Program Committee)  
July 1983 - Kobe, Japan (U. S. Chairman)  
April 1984 - Monterey, CA (Program Committee)  
September 1985 - Palermo, Italy (Program Committee)  
January 1987 - Reno, Nevada (Program Committee)

July 1989 - Tokyo, Japan (Program Committee)  
March 1991 - Monterey, CA (Chairman)  
September 1992 - Spain (Program Committee)  
September 1993 - Japan (Program Committee)  
Science of Polishing Topical Meetings:  
April 1984 - Monterey, CA (Chairman)  
June 1990 - Monterey, CA (General Chairman)  
International Lens Design Conferences:  
June 1985 - Cherry Hill, NJ (Program Chairman)  
June 1990 - Monterey, CA (Co-chairman)  
Counselor, Rochester Section, 1978-79  
Nominating Committee, 1979  
Program Chairman, Rochester Section, 1981-82  
Technical Chairman, Lens Design Group, 1981-82  
Technical Program Committee, 1992  
Fellow, 1983  
Education Committee, 1984-87  
Ad Hoc Committee on Society Objectives and Policy, 1985-86  
Ad Hoc Committee on Accreditation of Optical Engineers, 1985-86  
Ad Hoc Committee on Optical Engineering, 1985-86  
Newport Research Award Committee, 1985  
Annual Meeting Chairman, 1987  
Technical Council, 1986-87  
Member and Public Information Committee, 1993  
Optical Society of America - Offices:  
President, 1996  
Vice President 1994  
Board of Directors, Member-at-Large, 1987-89  
Engineering Council, 1988-91  
Chair, 1992-93  
Vice-Chair, 1990-1992  
Executive Committee of Board of Directors, 1988-89, 1992-97  
Congressional Fellows Selection Committee, 1995-97  
Public Policy Committee, 1997  
Senior Science Advisor, 2001-2002  
2003 OSA Leadership Award/New Focus Prize Committee, 2002-2003  
Advisory Committee, Forum on Optical Sensing for Homeland Security, 2002-2003

Optem (a Division of Thales)

Board of Directors, 2001-2002

Photonics Spectra Magazine

Editorial Board, 1987-91

Society of Exploration Geophysicists, 1983-present

Society of Photo-Optical Instrumentation Engineers, 1974-present

Gradient-Index Imaging Optics Meeting

September-October, 1980 - Huntsville, AL (Co-Chairman)

Education Committee, 1980

Fellow, 1981

Awards Committee Chairman, 1985

Board of Governors, 1986-88

Technology Transfer Committee, 1987

Women in Aerospace, 2001-present

**Other**

Optical Technology Program Review Committee, Monroe Community College, Rochester, NY, 1982-93

University of Maine (Orono), Physics Department Review Committee, 1982-84  
(Chairman , 1983)

International Advisory Committee, Microoptics Conference '87, Japan Society of Applied Physics, 1987

High Technology of Rochester, Advisory Board, 1988-93

Hubble Space Telescope Independent Optical Review Panel, Chairman, 1990-91

Overseas Advisory Committee, Third Microoptics Conference (MOC '91), Yokohama, Japan, October, 1991

Review Panel, Ontario Laser and Lightwave Research Center, Toronto, Ontario, Canada, January, 1995

International Advisory Board, Optical Review, The Optical Society of Japan, 1995-97

Steering Committee, Greater Regional Industrial Technology Program, 1995-97

Overseas Advisory Committee, MOC/GRIN '97, 6th Microoptics Conference and 14th Topical Meeting on Gradient-Index Optical Systems, sponsored by the Japan Society of Applied Physics, 1996-97

Environmental and Energy Services Division Review Committee (Chair), Idaho National Engineering and Environmental Laboratory, 2001-2002

Advisory Committee, First International Workshop on Glass and the Photonics Revolution, 2001-2002

Advisory Board, Georgia Tech School of Public Policy, 2002-

Strategic Review Steering Committee, Ontario County (NY) Office of Economic Development, 2002

**Teaching Duties**

Optics 100	Introduction to Optics	Spring 2001
Optics 121	Fundamentals of Optics	Fall 1974
Optics 241	Geometrical Optics	Fall 1975, 1977, 1978, 1980, 1981, 1982, 1984, 1987, 1988, 1995
Optics 395	Topics in Geometrical Optics	Spring 1996
Optics 392	Engineering Clinics	Spring 1993
Optics 441	Geometrical Optics	Fall 2001
Optics 442	Instrumental Optics	Spring 1975, 1976, 1977, 1978, 1981, 1982, 1984, 1986, 1987
Optics 443	Fabrication and Testing	Fall 1976, 1979, 1986, Spring 1985
Optics 444	Lens Design	Spring 1989, 1990, 1991, 1992, 1993, 1995, 1997
Optics 456	Graduate Optics Laboratory	Spring 1979, 1980
Optics 492	Technical Entrepreneurship	Spring 2002, 2003
Optics 591	Optical Entrepreneurship	Spring 1988, 1989
Optics 592	Advanced Optical Design	Fall 1985

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